

# CLAIMS

1. A multi-branched polymer containing a block structure, a graft structure or a star-shaped structure, which is represented by the following general formula (I):



wherein n is an integer of 2 or more; P<sup>1</sup> is a polymer chain having a number-average molecular weight (Mn) of 500 to 1,000,000, selected from a polyolefin chain (A1), a polyolefin chain having polar polymer side chains (A2), a polar polymer chain (A3) and a polar polymer chain having polyolefin side chains (A4); a plurality of P<sup>1</sup>s may be the same or different from one another provided that every P<sup>1</sup> is not the polar polymer chain (A3); when n is 2, at least one P<sup>1</sup> is the polar polymer chain having polyolefin side chains (A4); and X is a heteroatom or a heteroatom-containing linking group containing less than 200 atoms in total.

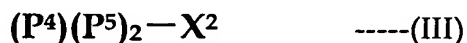
2. The multi-branched polymer according to claim 1, which contains a block structure or a graft structure represented by the following general formula (II):



wherein P<sup>2</sup> is a polar polymer chain having polyolefin side chains (A4) having a number-average molecular weight (Mn) of 500 to 1,000,000, and P<sup>3</sup> is a polymer chain having a number-average molecular weight (Mn) of 500 to 1,000,000, selected from a polyolefin chain (A1), a polyolefin chain having polar polymer side chains (A2), a polar polymer chain (A3) and a polar polymer

chain having polyolefin side chains (A4);  $P^2$  and  $P^3$  may be the same or different from each other;  $X^1$  is a linking group containing less than 200 atoms in total containing a group selected from an ester group, an amide group and an ether group.

3. The multi-branched polymer according to claim 1, which contains a star-shaped structure having three polymer chains bound to a central nucleus represented by the following general formula (III):



wherein  $P^4$  is a polyolefin chain (A1) having a number-average molecular weight ( $M_n$ ) of 500 to 1,000,000;  $P^5$  is a polymer chain having a number-average molecular weight ( $M_n$ ) of 500 to 1,000,000, selected from a polyolefin chain (A1), a polar polymer chain (A3) and a polar polymer chain having polyolefin side chains (A4); three polymer chains represented by  $P^4$  and two  $P^5$ s may be the same or different from one another;  $X^2$  is a linking group containing less than 200 atoms in total containing a group selected from an ether group and an ester group.

4. The multi-branched polymer according to claim 1, which contains a star-shaped structure having three or more polymer chains bound to a central nucleus represented by the following general formula (IV):

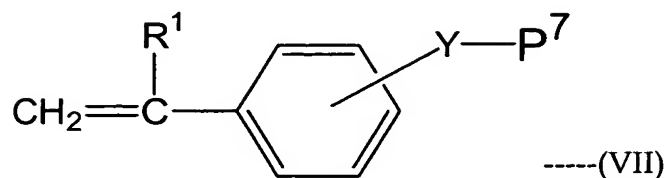
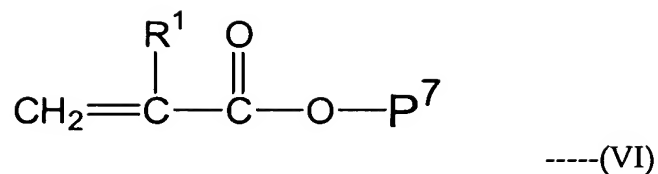


wherein  $n'$  is an integer of 3 or more;  $P^6$  is a polymer chain

having a number-average molecular weight (Mn) of 500 to 1,000,000, selected from a polyolefin chain (A1), a polar polymer chain (A3) and a polar polymer chain having polyolefin side chains (A4); a plurality of P<sup>6</sup>s may be the same or different from one another provided that every P<sup>6</sup> is not the polar polymer chain (A3); and X<sup>3</sup> is a linking group of less than 200 atoms consisting of a multifunctional low-molecular compound residue derived from a multifunctional low-molecular compound having three or more atoms or groups selected from a halogen atom, a hydroxyl group, a carboxyl group, an acid halide group, an amino group, an epoxy group and an isocyanato group.

5. The multi-branched polymer according to any one of claims 1 to 4, wherein the polar polymer chain having polyolefin side chains (A4) is obtained by homopolymerizing a macromonomer, or copolymerizing two or more macromonomers, selected from a polyolefin macromonomer (M1) represented by the general formula (V), a polyolefin macromonomer (M2) represented by the general formula (VI) and a polyolefin macromonomer (M3) represented by the general formula (VII), or by copolymerizing at least one macromonomer selected from (M1), (M2) and (M3) with at least one monomer (B) selected from organic compounds each having at least one carbon-carbon unsaturated bond:



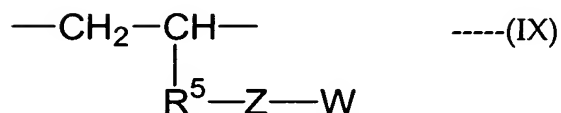
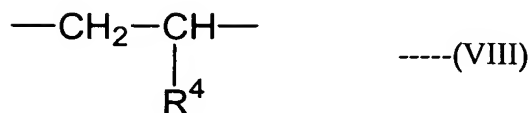


wherein  $\text{R}^1$  is a hydrogen atom or a methyl group, Y is a heteroatom or a heteroatom-containing group, and  $\text{P}^7$  is a polymer chain obtained by homopolymerizing or copolymerizing an olefin represented by  $\text{CH}_2=\text{CHR}^2$  whereupon  $\text{R}^2$  is a group or an atom selected from a  $\text{C}_{1-20}$  hydrocarbon group, a hydrogen atom and a halogen atom.

6. The multi-branched polymer according to any one of claims 1 to 4, wherein the polyolefin chain (A1) is a polymer chain obtained by homopolymerizing or copolymerizing an olefin represented by  $\text{CH}_2=\text{CHR}^3$  whereupon  $\text{R}^3$  is a group or an atom selected from a  $\text{C}_{1-20}$  hydrocarbon group, a hydrogen atom and a halogen atom.

7. The multi-branched polymer according to claim 1 or 2, wherein the polyolefin chain having polar polymer side chains (A2) comprises a unit (C1) represented by the general formula

(VIII) and a unit (C2) represented by the general formula (IX) :



wherein  $\text{R}^4$  is a group or an atom selected from a  $\text{C}_{1-20}$  hydrocarbon group, a hydrogen atom and a halogen atom,  $\text{R}^5$  is a  $\text{C}_{1-20}$  hydrocarbon group, Z is a heteroatom or a heteroatom-containing group, and W is a polymer chain obtained by (co)polymerizing an addition-polymerizable monomer (D), a ring-opening polymerizable monomer (E) and at least one monomer selected from polyolefin macromonomers (M1) to (M3) represented by the general formulae (V) to (VII).

8. The multi-branched polymer according to any one of claims 1 to 4, wherein the polar polymer chain (A3) is obtained by polymerizing an addition-polymerizable monomer (D) or a ring-opening polymerizable monomer (E).

9. A thermoplastic resin composition comprising the multi-branched polymer according to any one of claims 1 to 4.

10. A film, a sheet, an adhesive resin, a compatibilizing agent,

a resin modifier, a resin additive, a filler dispersant or a dispersant, which comprises the multi-branched polymer according to any one of claims 1 to 4.

11. A film, a sheet, an adhesive resin, a compatibilizing agent, a resin modifier, a resin additive, a filler dispersant or a dispersant, which comprises the thermoplastic resin composition according to claim 9.